

CLAIMS:

1. A transformed cell constructed from a living cell that has incorporated an expression vector which includes:

a gene of a plant virus having (i) a coding gene of a protein to be expressed, and (ii) a suppressor against a virus resistant reaction; and

an inducible promoter ligated to the plant virus gene.

2. A transformed cell as set forth in claim 1, wherein the plant virus is a tobamovirus.

3. A transformed cell as set forth in claim 2, wherein the tobamovirus is one of tobacco mosaic virus and tomato mosaic virus.

4. A transformed cell as set forth in any one of claims 1 through 3, wherein the inducible promoter is induced by a chemical substance.

5. A transformed cell as set forth in claim 4, wherein the chemical substance comprises a hormone.

6. A transformed cell as set forth in claim 5, wherein the hormone comprises a steroid hormone.

7. A transformed cell as set forth in any one of claims 1 through 6, wherein the living cell is a plant cell.

8. A transformed cell as set forth in claim 7, wherein the plant cell is a tobacco cell.

9. A transformed cell as set forth in claim 8, wherein the

tobacco cell comprises a tobacco BY-2 cell.

10. A transformed cell as set forth in any one of claims 1 through 9, wherein the protein expression vector is transferred by an Agrobacterium method.

11. A protein producing process, which uses the transformed cell of any one of claims 1 through 10.

12. A protein producing process as set forth in claim 11, comprising a step of culturing the transformed cell.

13. A protein producing process as set forth in claim 12, comprising a step of inducing transcription with a chemical substance.

14. A protein producing process as set forth in claim 13, wherein the chemical substance used in the transcription inducing step of a hormone.

15. A protein producing process as set forth in claim 14, wherein the hormone used in the transcription inducing step is a steroid hormone.

16. A protein producing kit for performing a protein producing process of any one of claims 11 through 15.

17. A protein producing kit as set forth in claim 16, comprising the expression vector of any one of claims 1 through 10.

18. A protein producing kit as set forth in claim 16 or 17,

comprising a hormone.

19. A protein producing kit as set forth in claim 18, wherein the hormone comprises a steroid hormone.

20. A protein producing kit as set forth in any one of claims 16 through 19, comprising a living cell which is used as a host.

21. A protein producing kit as set forth in claim 20, wherein the living cell comprises a plant cell.

22. A protein producing kit as set forth in claim 21, wherein the plant cell comprises a tobacco cell.

23. A protein producing kit as set forth in claim 22, wherein the tobacco cell comprises a tobacco BY-2 cell.

24. A DNA fragment for causing a cell to produce an arbitrary protein, said DNA fragment comprising:

cDNA of a virus vector that has been constructed by inserting a coding gene of an arbitrary protein into an RNA virus; and

a ribozyme sequence ligated to the 3' end of the virus vector cDNA.

25. A DNA fragment as set forth in claim 24, wherein the virus vector originates in a virus that includes single strand (+) RNA.

26. A DNA fragment as set forth in claim 24 or 25, wherein the virus vector originates in a plant virus.

27. A DNA fragment as set forth in claim 26, wherein the virus vector originates in a plant virus that has a suppressor against a silencing reaction of plants.

28. A DNA fragment as set forth in claim 27, wherein the virus vector originates in a tobamovirus.

29. A DNA fragment as set forth in claim 28, wherein the virus vector comprises one of tobacco mosaic virus vector and tomato mosaic virus vector.

30. A DNA fragment as set forth in any one of claims 24 through 29, wherein the ribozyme sequence comprises one of a ribozyme sequence of hepatitis delta virus and a ribozyme sequence of satellite tobacco ringspot virus.

31. A DNA fragment as set forth in any one of claims 24 through 30, wherein the coding gene of an arbitrary protein is inserted into a downstream side of a promoter of a gene that encodes a coat protein of the virus.

32. A DNA fragment as set forth in any one of claims 24 through 31, wherein the cDNA of the virus vector that has incorporated the coding gene of an arbitrary protein, and the ribozyme sequence ligated to the 3' end of the virus vector cDNA are transcribed under control of an inducible promoter that is located upstream of the virus vector cDNA and the ribozyme sequence.

33. A DNA fragment as set forth in claim 32, comprising a gene that encodes a transcription factor for controlling transcription induced by the inducible promoter.

34. A DNA fragment as set forth in claim 33, wherein the transcription is controlled by steroid hormone or estrogen.

35. A DNA fragment as set forth in claim 34, wherein the transcription is controlled by (i) GVG, which is a transcription factor whose transcription inducing ability is activated by steroid hormone, and (ii) 6XUASgal4, which is a promoter induced by activated GVG.

36. A DNA fragment as set forth in claim 34, wherein the transcription is controlled by (i) XVE, which is a transcription factor whose transcription inducing ability is activated by estrogen, and (ii) O_{LexA}-46, which is a promoter induced by activated XVE.

37. A vector, which includes the DNA fragment of any one of claims 24 through 36, and has an ability to be incorporated in a cell genome.

38. A vector as set forth in claim 39, wherein the vector is a Ti plasmid.

39. A transforming kit, which comprises the DNA fragment of any one of claims 24 through 36, and/or the vector of claims 37 or 38.

40. A transformant, which is obtained with use of one of (i) the DNA fragment of any one of claims 24 through 36, (ii) the vector of claim 37 or 38, and (iii) the transforming kit of claim 39.

41. A transformant in which a virus vector is transcribed

and expressed, and which is obtained with use of (i) a DNA fragment in which a ribozyme sequence is ligated to the 3' end of a virus vector that has incorporated a coding gene of an arbitrary protein, or (ii) a vector which includes the DNA fragment.

42. A transformant in which a virus vector originating in a tobamovirus is transcribed and expressed, and which is obtained with use of (i) a DNA fragment in which a ribozyme sequence is ligated to the 3' end of a tobamovirus vector that has incorporated a coding gene of an arbitrary protein, or (ii) a vector which includes the DNA fragment.

43. A transformant as set forth in claim 42, wherein the transformant comprises a plant or a cultured cell.

44. A transformant in which a virus vector is transcribed and expressed, and which is obtained with use of (i) a DNA fragment in which a ribozyme sequence is ligated to the 3' end of a virus vector that has incorporated a coding gene of an arbitrary protein, and which is capable of inducing transcription of the virus vector, or (ii) a vector which includes the DNA fragment.

45. A protein producing process, which uses the transformant of any one of claims 41 through 44.

46. A process for producing a transformant for protein production, comprising:

a first transforming step of transfecting a host cell with a transcription factor-expressing DNA fragment in which a coding gene of a transcription factor is ligated to a promoter for

expressing the transcription factor;

a screening step of screening transformants, obtained in the first transforming step, for an individual expressing the transcription factor; and

a second transforming step of transfecting the transformant, obtained in the screening step, with a protein-expressing DNA fragment in which cDNA of a virus vector that has been constructed by inserting a coding gene of an arbitrary protein into an RNA virus is ligated to an inducible promoter which is induced by the transcription factor.

47. A process for producing a transformant for protein production as set forth in claim 46, wherein the transcription factor has a property of being activated by hormone.

48. A process for producing a transformant for protein production as set forth in claim 47, wherein the hormone comprises estrogen or steroid hormone.

49. A process for producing a transformant for protein production as set forth in claim 48, wherein LexA-VP16-hER is used as the transcription factor having a property of being activated by estrogen, and wherein O_{LexA}-46 is used as the inducible promoter.

50. A process for producing a transformant for protein production as set forth in any one of claims 46 through 49, wherein the virus vector originates in a virus that includes single strand (+) RNA.

51. A process for producing a transformant for protein production as set forth in claim 50, wherein the virus vector

originates in a plant virus.

52. A process for producing a transformant for protein production as set forth in claim 51, wherein the virus vector originates in a plant virus that has a suppressor against a silencing reaction of plants.

53. A process for producing a transformant for protein production as set forth in claim 52, wherein the virus vector originates in a tobamovirus.

54. A process for producing a transformant for protein production as set forth in claim 53, wherein the virus vector comprises one of tomato mosaic virus and tobacco mosaic virus.

55. A process for producing a transformant for protein production as set forth in any one of claims 46 through 54, wherein a ribozyme sequence is ligated to the 3' end of the virus vector cDNA.

56. A process for producing a transformant for protein production as set forth in claim 55, wherein the ribozyme sequence is one of (i) a ribozyme sequence of hepatitis delta virus, and (ii) a ribozyme sequence of satellite tobacco ringspot virus.

57. A process for producing a transformant for protein production as set forth in any one of claims 46 through 56, wherein the coding gene of an arbitrary protein is substituted with a gene that encodes a coat protein of the virus.

58. A process for producing a transformant for protein

production as set forth in any one of claims 46 through 57, wherein the transcription factor-expressing DNA fragment and the protein-expressing DNA fragment are transferred by an Agrobacterium method.

59. A process for producing a transformant for protein production as set forth in any one of claims 46 through 58, wherein the host cell and the transformant comprise plants or plant culture cells.

60. A process for producing a transformant for protein production as set forth in claim 59, wherein the plant culture cells comprise tobacco cells.

61. A process for producing a transformant for protein production as set forth in claim 60, wherein the tobacco cells comprise tobacco BY-2 cells.

62. A transformant for protein production, which is produced by the process for producing a transformant for protein production as set forth in any one of claims 46 through 61.

63. A protein producing process, which uses the transformant for protein production as set forth in claim 62.

64. A producing kit for performing the process for producing a transformant for protein production as set forth in any one of claims 46 through 63.